

# Fissures caused by water mining

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CEDAR CITY - Pumping more water than is being recharge the aquifer, also called water mining, is causing earth fissures identified in Enoch and Quichapa Lake, the Utah Geological Survey reported to the Central Iron County Water Conservancy District Thursday.

The study commissioned by the CICWCD to the UGS came from a request by Enoch City officials to investigate a feature affecting a new subdivision in the northern part of that community on May 5, 2009. Enoch City Public Works Director Earl Gibson thought the massive land crack might be an active fault. UGS geologists responded to the request and subsequently mapped a 2.4-mile-long, generally north-south-trending earth fissure that had formed along the west side of the Enoch Graben area, an empty, 400-lot subdivision. The affected subdivision is near the south end of the fissure and has formed in basin-fill deposits, crossed several undeveloped lots and has cracked and vertically displaced asphalt concrete street surfaces, concrete curb and gutter and sidewalks, the UGS study said.

An inspection using a pipeline camera revealed that the flow direction of a sewer line crossing the fissure had been reversed and that it was no longer possible to gravity drain sewage from the subdivision. At the time of the inspection, the streets, curb and gutter, and underground utilities in the subdivision were less than 18-months-old, the UGS study said.

"Once the water is removed, it is removed permanently so the community should be concerned because this issue involves a scarce resource and will become more expensive the further you have to go to get water and will be less and less available," said UGS Geologist Bill Lund. "The second main issue is the land subsidence and earth fissures that are encroaching in the built environment, and when that happens, you have problems. Damages nationwide from fissures are \$125 million annually."

Lund explained to a room of 20 people that fissures in Cedar Valley are ground subsidence from removal of ground water from the pore spaces in the valley-fill alluvium - unconsolidated gravel, sand, silt and clay. The water mining reduces pore-water pressure and allows the drained alluvium to compress and the ground surface to subside, he said.

Earth fissures up to 10 miles long have been reported in Arizona, and the Las Vegas Valley has also experienced earth fissuring as a result of heavy groundwater pumping, he added. In the Cedar Valley, Lund reported groundwater level decline from 1939 to 2009 was between 101 to 114 feet. Land subsidence over 116 square miles since 1950 has

dropped as much as four feet, he said. The total length of the fissures in Enoch Graben and Quichapa Lake is 3.9 miles, but Lund estimates there are probably more to be identified. He also reported the Enoch Graben fissure is actively subsiding at a rate of 1.7 inches each year.

"Once you compact the aquifer, that's lost storage, meaning the aquifer won't be able to hold as much water as it used to be," Lund said. "Fissures are going to have to be dealt with as a hazard for the foreseeable future."

Recommendations by the UGS to rectify fissuring are still in process, but Lund said in general mitigation terms some solutions include, but are not limited to, keeping water out of earth fissure paths, avoiding such areas where possible, defining hazard zones and requiring investigation prior to new development, incorporating grading plans, restricting land use and promoting water conservation.

Rod Mills of Nolte Engineering questioned Lund about a recent bedrock aquifer study Gary F. Player presented to the Cedar City Council, Oct. 13. Player said "Each square mile of mountains between Ashdown Wilderness and downtown Cedar City has about six times the water at a depth of 1,000 feet than Panguitch Lake."

Lund said he didn't feel comfortable commenting because he hadn't reviewed the study but did say if a test well was drilled east, beyond the Hurricane system of fault, a potential ground-water barrier could exist and not affect the Cedar Valley aquifer. Since that scenario isn't known, a barrier is speculative, and one of the reasons he said he was interested in reading Player's study, he added.